

# SINC - LINC

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# INTEGRATED DATA SYSTEMS

NOW FEATURING The EPROM SERVICES Dual Centronics Interface for TS1000/ZX81. This card is port mapped, using the 8255 PIA chip. It provides two standard Centronics configured ports, 1 for Output to printer, the other for data input. A 32 byte PROM on the I/F overrides the ROM printer routines, and redirects these commands to driver software located elsewhere. This I/F FULLY supports BASIC LPRINT, LLIST, and COPY statements, including COPY as direct command.

Driver software included: loads above RAMTOP, but can be relocated to work in REM statement OR the 8-16K block. Two translation options provided: INVERSE=CAPS, or inverse= lower case. We will have the Printer Toolkit for this I/F within the next month: provides highly enhanced driver software, and several powerful utilities.

E/S Centronics is a cartridge-type card. Supplied with "T-dock"-type connector: permits piggybacking RAM, etc. I/F can be removed or inserted WITHOUT disturbing other peripherals.

E/S Centronics W/ T-dock: \$89.00 CAN. + \$1.50 P&H

5 Foot Printer Cable: \$30.00 CAN. + \$1.00 P&H

## WORD SINC II.5/Centronics INTRODUCTORY SPECIAL:

Includes WSII.5, EPROM SERVICES I/F, PRINTER CABLE, PLUS MCODER II COMPILER: +WordFont ALL FOR \$ 185.00 CAN. DELIVERED.

TS1016 RAMS: \$26.00 DELIVERED

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ALL ZX SOFTWARE EXCEPT WOODS, HARGRAVE, McMULLIN, & INTEGRATED DATA:  
2/\$20.00 + \$1.50 P&H

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Integrated Data Systems 30 Brookmount Rd. Toronto Ont. Canada M4L 3N1

## LETTER FROM THE PRESIDENT

In the past few months our club has started exchanging newsletters with about 18 other T/S User Groups. There is much interesting and useful stuff in these newsletters. So much so that I have started circulating them among key club members. I say key members. What I mean is that I have routed them to members who, in my estimation, would benefit the club most by being aware of what other clubs are doing.

Whether this is 'fair' I'm not so sure. You will have to forgive me. I would now like to extend this routing to others in the club, including our out-of-town members.

Cameron Hayne is handling the administrative end of this, and you can speak to either him or myself, to get on the distribution.

Our club continues to thrive. We have a paid-up membership of about 120, and this includes about 40 members served on a correspondence basis.

Yours in 'mucking about' with your computer,

George Chambers

If you have an article you would like published in the newsletter, give it to any member of the executive during the meeting or mail it to SINC-LINK c/o J. Roach, 33 Dundalk Drive, #23

Scarborough, Ontario M1P 4X6

# SYNCSITS

Ian Robertson

**UPDATED TOPICS:** With all the TS activity around everyone should be familiar with all the latest "goodies" entering the market for the TS2068, i.e. the Spectrum Rom issue (Romswitch, Emulators and Rom replacement) which is still unsettled due to the number of Spectrum programs which either will not load or will not run properly. For example, I cannot load Hisoft C and I cannot run Airwolf after it is loaded (and this is with 10k pullup resistors on data lines D0, D1, D3, D4, D5, D6, D7 to Vcc). There is also the matter of running Spectrum hardware, which at the moment only runs using the Emu Emulators (which fit into the cartridge port). More on this subject further on in this article.

Another interesting topic concerns mass storage, either by Sinclair Microdrive or by the new Rotronics Wafadrive. The U.S. prices for each is (reasonably) comparable to the U.K. prices (well, almost). One new company that is REALLY holding their prices down is THE ENGLISH MICRO CONNECTION, 15 Kilburn Court, Newport, Rhode Island 02840, U.S.A., telephone 401-849-3805. EMC is an agent for several U.K. hardware companies. This means EMC takes your order and the item is shipped directly from the U.K. to you. This is a good idea if you do not know what item is available and where it can be purchased. I will be giving a copy of their catalogue to our Library for members to peruse. EMC does carry Spectrum software in stock, at almost U.K. prices. I talked at some length with Bob Dyl of EMC and this man is a fountain of information regarding the U.K. market. He will be carrying the Timex Portugal T2068 for \$159.95 and the Timex Disc Drives upon their release in the U.S. in June. The price is \$239.95 for the first drive with interface and \$125.00 for the second drive. He is presently taking orders. There is also a hardware item available which converts both the TS2068 configuration and voltages to the Spectrum specification. The simple way to perform this yourself is to look in the last issue of SINC-LINK (second last page) at the drawings for all three edge connectors. From this you can see the wiring required and also where to install the two regulators (9 and 12 volt) fed from the 15v on the TS2068 bus. The commercial item available from EMC is a "Microdrive Interface" which is supposed to run in conjunction with the Romswitch. This means that all of us with the Romswitch will not have to buy an Emulator!

**TS2068:** There is really a lot either happening now or about to happen. An interesting example of a new product is the ZEBRA SYSTEMS KOALA PAD. This is a reasonably sophisticated method of transferring patterns/artwork to either a printer (32 or 80 column) or to memory. Once I get the hang of both the Koala and the TECH DRAW software I will give a demo at one of our 2068 nights. While on the subject of ARTWORKX, I must say that one of the BEST programs on graphics, that I have seen, was demo'd at our April 17 meeting by the author, David Ridge. This program will be carried by RANEX and retailed at \$19.95 U.S. for the TS2068. The Spectrum version is forthcoming. It has several features that TECH DRAW does not have and lets you perform all this using a joystick. HIGHLY RECOMMENDED!! RAY KINGSLEY has his new Exrom out. This version will be of more use once we have the

ability to bank switch and our 2068 becomes our TS2192. Ray Kingsley can be contacted at SINWARE P.O. Box 8032, Santa Fe, NM 87504. The price for the Exrom is \$16.00 (US). This ROM (eprom) can be installed without either soldering or altering your TS2068. He also says that he is working on a true 64 column screen for the TS2068/TS2192.

**TS1000:** Long live the TS1000/ZX81! It appears that some people believe this, as the market is not quite dead yet. A couple of interesting items are available. Tom Bent, editor of SincWare News has a version of the ROM available from Thomas B. Woods. This version corrects the LPRINT and the DIVIDE bugs, the SCROLL command and even makes the Q, W, V and K easy to read. It installs without modifying your ZX81/TS1000. The two of us that have and use this item are pleased with it and we are even used to the computer initializing in the FAST mode. There is a new piece of software for the ZX81 and what a piece it is! It is called SINC-ARTIST 1.3 and is by CALLISTO SOFTWARE 924 2nd St. East, Saskatoon, Sask. S7N 1R1. HIGHLY RECOMMENDED!! Ian Singer will be carrying it (INTEGRATED DATA SYSTEMS, 30 BROOKMOUNT ROAD TORONTO M4L 3N1, 416-699-6380). I also see references to a MTERM II software program for the TS2050 Modem. If this is true it should encourage those that would like a Modem, but are resisting buying a TS2068 just to access a smart modem. I happen to like the TS1000/TS2050 combination, I even have MTERM on eprom for fast loading. Both MODEMS are available from IDS.

**SPECTRUM:** Anyone that is using BETA BASIC 1.8 and would like the clock function to keep North American 60 hz time can simple Poke 56866,60 (the tics per second address). Brian Hammond has talked me into using the clock/alarm function to control timings (computer and social) while working at the keyboard. And guess what - it works! Brian says "if you have a computer and the software, why not get into the habit of using them". Thank you Brian. Print and Plotter have a revised version of Paintbox out, it is called PAINT PLUS and includes 24 new commands. It will have to be good to match ATRWORKX! How would you like to have a Spectrum Plus? According to Bob Dyl several members of the Ocean City Users Group are running Spectrums. This is done by using a ZX81 9v 1 amp. power supply and changing to the Spectrum connector. It runs on channel 36. The Spectrum Plus has a 58 key keyboard with lots of single entry capability. At the moment I'm thinking about getting one and quite possibly either the Sinclair Microdrives or a disc system and would appreciate any comments.

**EDITORIAL COMMENT:** Now that the TS MARKET is in the midst of a miniboom, we enthusiasts should take note of a statement issued by the Prime Minister of Japan. He asked each and every citizen of Japan to spend \$100.00 on imported items during the coming year. I think it behooves each and every TS USER to spend a little loot on some software or hardware during the current year. If we do not, it is possible our computer could die (marketwise that is). The present healthy state of the marketplace indicates that a lot of users are buying. I sure do my share!

## **BELATED INTRO:**

After reading my last article, some of you will be wondering what direction this column might take. In this and future columns, you will find information on the latest hardware additions, projects, and reliable parts sources. Plus reviews of new software, books, and other sources of support for Our Computer: the ZX81 and TS1000. Hence the new title.

Exploration of the workings of machine code will be pursued, along with some advanced BASIC applications.

I will attempt to answer letters from readers. Suggestions for future subjects will be considered. Some letters will be published, but if you expect a personal reply, you **MUST** include SASE.

## **ON WORDPROCESSING:**

It is clear that with the addition of a real keyboard, a suitable printer interface, and good software, the ZX81 CAN indeed become a wordprocessing machine with impressive capabilities!!

This is important to me, since in addition to preparing this column, I write a LOT of letters. Well over half my computer time is spent processing text. To follow up on last issue's lead: Word Sinc II.4 [(c)P.Hargrave], written for the Memotech Centronics I/F, works as is, after a limited fashion, with the Epron Services I/F. Some customization is required to get full use of printer escapes along with desired punctuation.

Since last issue, I have nothing but good news in this area. **THIS ENTIRE PAGE** was produced using WORD SINC II.5.

With no small amount of help from Powell Hargrave, I have written the "II.5 enhancements" for Word Sinc. In addition to the facilities of W.S. II.4, this new version features presettable left margin, auto Form-Feed with each page, graphic logo design and custom font utilities, and a printscreen utility which copies the screen as ZX characters using printer graphics mode and the ZX ROM character generator. Embedded printer escapes are transparent to the text justify routines.

W.S. II.5 is written for the EPROM SERVICES Centronics I/F, and contains complete built-in driver software for the I/F card. Compatible printers include EPSON MX/RX80, STAR Gemini 10X, Mannesman Tally SPIRIT 80, and in fact just about any EPSON workalike.

The EPROM SERVICES I/F is very adaptable. The I/F card holds a 32 byte PROM, which patches the ROM COPY#D routine to driver code that may run above RANTOP, or in the 8-16K area. Having the actual code in RAM makes it easy to POKE in CALLs to the new subroutines which provide graphics, custom font, and left margin features.

Although the MEMOPAK I/F uses full EPROM driver code, I will try to adapt my new routines to it in the near future. Further refinements to Word Sinc will no doubt continue.

As soon as I can get final approval from Mr. Hargrave, and complete the Program Manual, Word Sinc II.5 will be available from Integrated Data Systems, along with a separate printer utilities toolkit package.

**ERRATUM:** ZX PRO/FILE must be POKEd as for a TS2040 printer to work properly with the E.S. I/F, not with the MEMOPAK code as stated last issue.

## **MORE VIDEO UPGRADE STUFF:**

John Oliger's ZX81 Video Upgrade has attracted a lot of attention lately. Contrary to my postulations last issue, the Interrupt Vector is still used by the video system. Thus, it can't be used to service other hardware interrupts, at least not if you need video!

All the other good things are true, though. The kit version is now supplied with single +5V. (4516) video RAM, so no extra power supply is needed.

John Oliger has supplied me with a very simple modification for the Gladstone 64K RAM, which makes it compatible with his scheme to run machine code above \$C000 (48K). This will be printed next issue if sufficient interest exists.

Mr. Oliger has several offerings for the ZX81/TS1000, including a great 64K RAM, EPROM Burner and Reader cards, a printer I/F, and Motherboards to plug everything into. All his products are available as bare PC board only, or with a complete parts kit.

The VDP, its crystal, and the required new ROM are NOT included with the Video Upgrade Kit, and must be purchased separately. Here are some good sources:

JAMECO ELECTRONICS INC.

2175 ave d'Orleans,  
MONTREAL, P.Q. H1W 3S1

1-(800)-361-8080 toll free

Jameco sells the T.I. TMS9918AN VDP for \$9.95 each.

They also have very good prices on memory ICs. Examples are 2764 EPROMs @ \$6.75, HM6116LP3 static RAMs @ \$4.79. Jameco will accept telephone orders, and are pleasant to deal with. Catalogue is free.

SAYAL ELECTRONICS

3791 Victoria Park Ave. #8,  
SCARBOROUGH, Ont. M1W 3K6  
(416) 494-8999

Sayal has the 10.7386MHz. video crystal in stock for under \$5.00. They get an A+ rating as a hobbyist parts supplier.

I have found 74LS ICs and Z80 peripheral ICs at SAYAL when everyone else in town was out of stock, and the prices are often the best around. Paul Sayal tells me he has a new 40 page catalogue, free for the asking. Significant discounts are offered on quantity orders >10 pieces.

You will need to provide your own new system ROM, which must be burnt into a 2764 EPROM. Although John Oliger supplies a cassette tape (for U.S.\$6.95) with all his ROM video code modifications, it is up to you to burn your own EPROM. There are other ROM debugs and enhancements which can also be made at this time: see this month's SYNCBITS column, by Ia Robertson.

For those who do not wish to invest in an EPROM burner (c'mon guys- well worth it!), I may be able to provide this service for a nominal fee.

You will need to obtain the manuals on the Video Display Processor itself. These manuals are available **FREE** from your local Texas Instruments Sales Office. (don't go to a T.I. Distributor: distributors will charge you for these books)

Phone T.I., 280 Centre St.E., Richmond Hill, L4C 1B1, (416) 884-9181, and ask for microprocessor literature support Request Publication# MP010A: The 9900 Series Video Display Processors Data Manual, and Pub.# SPPU004: the Video Display Processors Programmer's Guide. An absolute wealth of information is contained in these manuals!



## ZX81 NEWS cont...

It is exciting to note that if sufficient interest in the Video Upgrade is generated and some enterprising programmers catch on, a new wave of high-speed, enhanced video software could spring up to take full advantage of the new VDP capabilities. I will be in contact with user groups across the continent in an attempt to locate, or initiate a VDP SIG.

For details on ordering your Video Upgrade kit and other hardware, write to:

The John Olinger Co.  
11601 Whidbey Dr.,  
Cumberland, IN 46229  
U.S.A

When writing to John, or any other ZX/TS supplier, always include a SASE. If writing to the U.S. or U.K., send SAE and Postal Reply Coupons- get 'em at the Post Office. This is generally appreciated and greatly increases your chance of receiving a reply.

## CENTRONICS PRINTER BUFFER

FINALLY: a great "dedicated" application for one of those extra ZX81s you have hidden in a closet!

One of the major drags in wordprocessing (or spreadsheeting or file output) is having your computer "tied up" during long printouts. The solution is a "printer buffer" or "print spooler" which usually consists of a microprocessor, some RAM, and operating software which allows printer data to be sent to the extra RAM all at once. Then, the data can be sent along at printer speed, while the "host" computer is free to work on the next task at hand. In upcoming issues, I will present a construction project consisting of a dual-Centronics configured port, and EPROM reader. Software will be developed to allow input, storage, and output of ASCII data via Centronics communication.

The goal is a "smart" 16K or 64K print spooler or "sideways RAM" which can be used with ANY Computer-Printer or Data Acquisition system using standard Centronics protocols. Stay Tuned!

## NOTEWORTHY SUPPLIERS:

BUDGET ROBOTICS & COMPUTING  
BOX 18616, Tucson, AZ 85731 U.S.A.

...have acquired marketing rights for the Computer Continuum Buffered Bus Expansion Board, as well as the ZODEX RX81 parallel I/O card. The Bus Board is U.S.\$40.00 for bareboard and manual, \$62. for a partial kit, \$80. for the complete kit. The bareboard seems like the best deal. Watch for more details on this interesting company.

TORONTO SOFTWARE WORLD  
P.O. BOX 84, Agincourt  
Ont. M1S 3B4

...are handling the Hi Res programs for ZX81/TS1000 from Software Farm in U.K. This includes 3 reportedly excellent games which will be reviewed here shortly.

SIRIUS WARE  
6 Turningmill Rd.

Lexington, MA 02173 U.S.A.

...is operated by Dave Wood. Dave has written a wordprocessing program called WORD\* for ZX81. In the process of documenting his program, he wound up writing a book entitled Machine Language Programming On The TS1000. Both the book and the program have received excellent reviews elsewhere. I hope to have copies to review soon.

## HOT BASIC no. 1

Have you ever wished the INKEY\$ function could be used to check for a combination of two keys depressed at once?

Take heart, there is a nice way around this problem. The SYSTEM VARIABLE called LAST\_K, located at 16421-16422, returns a unique numeric value between 0 and 65535 for any key pressed, and also for just about any multi-key combination! Therefore, in a program, you can use

PEEK 16421+256\* PEEK 16422 instead of INKEY\$. A practical example might be using this to get a "diagonal" result by pressing two cursor keys at once.

This short listing will let you find values for different combinations of keys, and see how the principle works.

```
10 PRINT AT 5,0;"PRESS A KEY COMBINATION."  
20 PRINT AT 9,5;"CURRENT LAST-K VALUE"  
30 LET K= PEEK 16421+256* PEEK 16422  
40 PRINT AT 10,10;" "; AT 10,10; K  
50 GOTO 30
```

Note: In LINE 40, 5 spaces between the quotes. You can record the values you get for use in your own programs. Note that the "current" value is shown ONLY while you have the key(s) depressed.

## HOT BASIC no. 2

Here is another example of How It Pays To Know Your System Variables.

The infamous 0 REM machine code line can cause problems if it has had the two "NEWLINE" codes POKED in to make the machine code disappear from the listing. You may find that while you can LIST a different line number, if you ENTER a new line, or do some EDITing, that 0 REM keeps popping up again and again. Very distracting, isn't it?

We can fix the problem by POKing the SYSTEM VARIABLE called S\_TOP, at 16419. It holds the value of the top line number in automatic listings. To do it, first determine the line number of the first "normal" BASIC line after the machine code. For our example, let's say this is line 5. Follow these steps:

```
LIST 9999 & ENTER  
POKE 16419,5 & ENTER  
LIST 5 & ENTER
```

Voila! So long as you don't get careless and enter "LIST" without a line number, the display listing will behave normally.

This technique can be useful in regular BASIC programming, too. Can you see how?

## ARE YOU ONE OF THESE PEOPLE?

If you don't feel that you're "getting enough" out of the User Club, look for yourself in this little story by a famous author called ANON.

This Story is about 4 people named Everybody, Somebody, Anybody, and Nobody.

There was an important job to be done and Everybody was sure that Somebody would do it. Anybody could have, but Nobody did. Somebody got angry because it was Everybody's job. Everybody knew Anybody could do it, but Nobody realized that Everybody wouldn't do it. IT ENDED UP that Everybody blamed Somebody when Nobody did what Anybody could have done.

\*\*\*\*\*  
That's my 12K worth for this issue! Until next time, have fun with your computer.

BASIC allows you to MERGE a second program with one already existing in memory but the line numbers of the two programs must be different or else the old lines are lost. It might be useful to be able to have two different BASIC programs in memory at the same time but totally independent of each other. For example:

```
10 REM program #1
20 PRINT "I'm #1"
30 GOTO 20

10 REM program #2
20 PRINT "I try harder!"
30 GOTO 20
```

This can be accomplished with the aid of the short machine code program in listing 1 below. What it does is set up a second BASIC area starting at a user specified address and then provides a switch between the two areas. This program is in the club library under the name "2programs". You can load it to any address you like where there is a clear area of 87 bytes. LOAD "2programs" CODE r will load it to address r. To use the program, first POKE 23760,LOW and POKE 23761,HIGH where HIGH and LOW are the high and low bytes of the address where you want your second BASIC area to start. (HIGH=INT(address/256) and LOW=address-256\*HIGH) This address must be above STKEND, the end of your present BASIC area. Exactly how much above depends on how much bigger your first BASIC area will grow. To find out STKEND: PRINT PEEK 23653+256\*PEEK 23654

To set up the second BASIC area and switch over to it use RAND USR r. You should see the K cursor. You can now enter BASIC program lines, load a new program from tape, define variables etc., all independent of whatever is in your previous BASIC area. To switch back to your original BASIC area, execute RAND USR (r+23). Further executions of RAND USR (r+23) will switch back and forth between the two BASIC areas.

The machine code uses the addresses 23760 through 23767 to store the alternative values of the system variables PROG, VARS, E-LINE and RAMTOP. All other system variables are common to both BASIC areas, although others could be stored and switched over. (eg. UDG, ATTR-P etc.) In listings below I use the hex addresses and the abbreviations of HOT-Z.

The reason why I found it useful to have two BASIC areas is so that I can include BASIC statements in my machine code programs without interfering with a co-resident BASIC program. In particular, I wanted to use the INPUT command, which seemed difficult to implement otherwise. To do this I just switch to the second BASIC area, type in my numbered BASIC statements and switch back. At the point in my machine code program where I want the INPUT operation I insert the machine code in listing 2. The last statement of my second BASIC program should be a USR call to the address of the continuation of my machine code program.

#### ASSEMBLY LISTING 1

	Mnemonics	Comments
SET-UP :	LD HL, (rmtp) LD (5CD6), HL LD HL, (5CD0) LD (5CD2), HL LD (HL), 80 INC HL LD (5CD4), HL DEC HL DEC HL LD (rmtp), HL	get RAMTOP store it get alt PROG setup alt VARS =128 dec (end of file mark) set up alt E LINE set RAMTOP to just before the 2nd BASIC area
SWITCH :	AND A	reset the carry flag
SYSVARS:	LD DE, (5CD6) LD HL, (rmtp) LD (5CD6), HL LD (rmtp), DE LD DE, (5CD0) LD HL, (prog) LD (5CD0), HL LD (prog), DE LD DE, (5CD2) LD HL, (vars) LD (5CD2), HL LD (vars), DE LD DE, (5CD4) LD HL, (elin) LD (5CD4), HL LD (elin), DE	get RAMTOP an the alt RAMTOP and switch them get PROG and the alt PROG and switch them get VARS and the alt Vars and switch them get E LINE and the alt E LINE and switch them
	CALL 133F	this is CLEL (or smim to HOT Z) which sets WORKSP STKBOT and STKEND
	RET C	return if the carry flag is set (this is so SYSVARS can be called as a subrtm from machine code
	JP 0E28	Jump to the main loop of the BASIC interpreter

#### ASSEMBLY LISTING 2

Mnemonics	Comments
SCF	set the carry flag so SYSVARS will return
CALL SYSVARS	switch system variables
LD IY, 5C3A LD (IY+31), 02	only required if m/c program has changed these (IY+31=DF SZ)
LD A, 01 LD HL, line#	execution to start at the specified line#
INC HL CALL 16D6	FIND-L (liad to HOT Z) which finds start and end addr of the line
DEC DE JP 1B27	jump to execution stage of BASIC interpreter

# 2068 KEYBOARD NOTES By Cameron Hayne

## Testing For Keys Pressed:

The BASIC function INKEY\$ returns a string with the value of the key pressed, if the "S" key is being pressed then INKEY\$="S". If no key is being pressed INKEY\$="" (the empty string). Thus INKEY\$ can be used to test for keyboard input. There are limitations to this use, if the lower case "e" is being pushed then INKEY\$="e" but if the upper case "E" is being pressed then INKEY\$="E", so these two cases will have to be tested for separately. (The 2068 does distinguish between strings "e" and "E" but not between variables e and E.) Also, if ENTER is being pressed, or if more than one key (aside from a shift key) is being pressed, then INKEY\$ will return an empty string as if no keys were being pressed.

An alternative method is to use the BASIC function IN. For example, IN 63486 would return a value of 15 if the "S" key were being pressed. So we can use IN to test for a certain key being pressed just as we might use INKEY\$, eg. IF IN 63486=15 THEN ..... The use of IN overcomes the limitations mentioned above on the use of INKEY\$. If the key with the letter "E" on it is being pressed then IN 64510 will equal 27 whether it is upper or lower case. If both the "S" and "4" keys are pressed together then IN 63486 will equal 7. In all the above examples the value returned would be 31 if no keys in the same half row were being pressed.

How do you know what number to use with IN and what number it will result in? Well, you can just look in the table below. I found out by experimenting. (Now that I have a copy of The Intermediate/Advanced Guide, I find that the information is on page 101.)

Try INPUTting values of x between zero and 255 with the following:

```
10 INPUT X
20 PRINT AT 0,0: IN(254+X*256)
30 GOTO 20
```

BREAK in and RUN to try a new value

You will find that if x=0 all the half rows are activated so that they respond to a keypress. Non-zero values for x de-activate half rows according to the binary form of x. The table below shows the values of x to use so that only the single half row indicated is activated. Also shown is the number to be subtracted from 31 to find the value given by the IN function when that key is pressed. For example, IN 49150 will equal 31-1=30 when ENTER is pressed, 31-2=29 when "L" is pressed, 31-1-2=28 when both ENTER and "L" are pressed, etc. If no key in that half row is pressed then IN 49150=31.

A technical note: It is only the first five bits of the value returned by the IN function that are relevant to the keyboard. In the 2068 it seems that the other three bits are always zero, except during tape loading, hence the 31. However, on the Spectrum these other bits are not necessarily zero - so beware!!!

The same method can be used in machine code to provide a means of reading the keyboard which is often faster and simpler than using the ROM routine K-SCAN. (Which Stan Piotrowski explained in newsletter Vol 2, #6) Use the instructions:

```
LD A, X
IN A, (254)
CP test
```

where x is the value appropriate to the half row the key is in, and test is the value obtained by subtracting the key value from 31. The zero flag will be set (ie. Z=1) if the key is being pressed, otherwise it will be reset.

X	1	2	3	4	5	6	7	8	9	0
247	I	2	3	4	5	6	7	8	9	0
	-1	-2	-4	-8	-16	-16	-8	-4	-2	-1
251	Q	W	E	R	T	Y	U	J	O	P
	-1	-2	-4	-8	-16	-16	-8	-4	-2	-1
253	A	S	D	F	G	H	J	K	L	ENTER
	-1	-2	-4	-8	-16	-16	-8	-4	-2	-1
254	CAP SHIFT	Z	X	C	V	B	N	M	SYM SHIFT	BRK
	-1	-2	-4	-8	-16	-16	-8	-4	-2	-1

X	254 + X * 256	X
247	63486	239
251	64510	223
253	65022	191
254	65278	127

KEYBOARD VALUE  
TABLE

## MORE KEYBOARD NOTES By Peri Feral

If Toni Baker can become famous by writing about machine code then maybe I can too by writing about add ons for the ZX81 and 2068 that are available locally. Whenever you want to add something onto your system remember me, Peri Feral.

First, we have some adds in this newsletter for products being sold by fellow club members. Second, there are some good buys on full size keyboards.

Active Surplus Aimex on Queen St.  
"NABU" unwired k'bd \$10.00

Your local Radio Shack  
TI 99/4 surplus k'bd with PC board  
for only \$5.95!!

## 2068 KEYBOARD NOTES By John Roach

The 2068 seems to use the Z80 extended addressing I/O capabilities (register indirect addressing) in a combination of hardware and software to read the keyboard as 8 separate ports.

During a port read, initiated by the IN command in BASIC, all 16 address lines are used and remain active during the entire port read operation.

Each address line of the high byte is connected to a row line of the keyboard and when a key is pressed in a row where the address line is low, it connects to a column line which is connected to the data bus, putting it low - the data bus is strobed into the port latch and the port is read by the 2068.

This all means that each of the ports available for use on the 2068 could address 256 peripheral devices.

Refer to the Table which shows the values of the 8 port addresses used by the 2068 keyboard.

If IN(Addr) returns 31 when no key is pressed then the binary value on the data bus read by the port is BIN 0001 1111, or 31 decimal - D5, D6, and D7 lines have been put low by hardware ?? or software ??

The Spectrum may not put D5, D6, and D7 low when reading the keyboard port as when no key is pressed it will return a value of 255 (BIN 1111 1111). Some reports indicate later models of the Spectrum start returning a no key pressed value of 191 after they warm up, indicating a probable shorting of D7 or port chip latching problems.

Will this work ??

Assume that you have a menu on the screen with 5 options (branch or subroutine) to select and you do not want to use an INPUT statement:

```
10 print at 20,15;"Enter selection #"
20 let x=IN 53486
30 if x=31 goto 20
40 let x=31-x
50 gosub x*100
```

## 2068 PECULIARITIES By Cameron Hayne

I discovered something very peculiar about the 2068 when I tried to put some machine code into the area of memory normally occupied by the RAM-resident code "function dispatcher". It seems as if machine code routines in this area (6200 Hex or greater) run more slowly than identical routines elsewhere in memory !!! To see this for yourself, try putting the routine shown below at two locations: at A000 and at 5200, then run the two routines. Enter the routine at A000, saving it to tape and then comparing the results of the two sequences:

1. LOAD "" CODE 40960 (=A000 hex)  
PRINT USR 40960
2. LOAD "" CODE 25088 (=5200 hex)  
PRINT USR 25088

```
A000 F3          DI
A001 3E02        LD A,02
A003 47          LD B,A
A004 21FF1F      LD HL,1FFF
A007 10FE        LOOP DJNZ,LOOP
A009 D3FE        OUT (FE),A
A00B EE0F        XOR 0F
A00D 06A4        LD B,A4
A00F 2D          DEC L
A010 20F5        JR NZ,LOOP
A012 05          DEC B
A013 25          DEC H
A014 20F1        JR NZ,LOOP
A016 FB          EI
A017 09          RET
```

## ZX81 AND 2068 EXPANSION BOARDS

2068 Emulator board less Spectrum ROM  
...\$10.00

2068 Cartridge board, complete less EPROMs  
....\$15.00  
Bare board ....\$10.00

2068 EPROM burner complete less power supply ....\$35.00  
Bare board ....\$15.00

ZX81 EPROM read board complete less EPROMs  
....\$15.00

ZX81 EPROM burner complete less power supply ....\$35.00

ZX81 and 2068 EPROM burner power supply  
....\$25.00

Burners will do 2716 2732 and 2764 EPROMs.  
All complete boards include programming documentation.

Contact ....DANIEL ROMAN ....  
95 Havenbrook Bl. #1111,  
Willowdale Ontario M2J 1A9  
Telephone 416-491-7493

## .....TABLE OF PORT ADDRESSES.....

ADDR. LINE.	DECIMAL	HEX.	BINARY ..HIGH.BYTE..	BINARY ..LOW.BYTE
A15..	32768.	7FFE.	..0111.1111.	1111.1110
A14..	49152.	BF00.	..1011.1111.	.....4....
A13..	57344.	0FFE.	..1101.1111.	.....3....
A12..	61456.	EF00.	..1110.1111.	.....A....
A11..	63488.	F7FE.	..1111.0111.	.....N....
A10..	64512.	FBFE.	..1111.1011.	.....E....
A09..	65024.	FD00.	..1111.1101.	.....4....
A08..	65278.	FEFE.	..1111.1110.	1111.1110



# RGB MONITOR

(for 2068)

The J.I.L. 14" colour monitor is sold by Gladstone and by Consumers Distributing. I got mine at C.D. for \$150 less!!! It is apparently a substitute to the one shown in CD's 84/85 catalog but it may replace it permanently. For only \$349 it is a bargain because it is capable of composite video, RGB video, or separate video and also has a sound amplifier. I did, however, run into a few faults.

Firstly, there is a bad misprint in the manual. If you connect the colours (r,g,b) according to Jutan, none of them will be correct except white and black. The labeling on the 8-pin DIN connector has red, green & blue mixed up. They should be as illustrated on the next page.

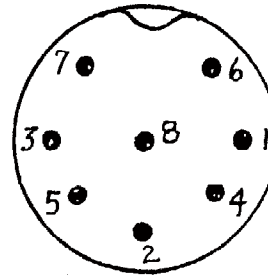
The manual does not deal with 2068 signals. The circuit in the 2068 Technical Manual gives us combined H&V (horizontal & vertical) sync. This should be fed into the horizontal pin on the monitor. The RGB Mode switch should be in the III position.

Lastly, the separate screen adjustments inside my monitor were incorrectly adjusted. They set the level of each colour gun and can be found on a circuit board mounted on the CRT socket. These are labeled RED, GREEN and BLUE. I found that Blue had to be turned much higher than the others to get a good white colour. It is helpful to display a band of each colour when adjusting these. Note; when building the sync separator circuit, the last stage for vertical sync is not required.

In summary, it took a bit of trial and error but the results are crystal clear colours. Even in 64 columns, the letters are very legible and have no coloured halos around them.

FRED SCHAKEL  
London T/S Club

## D.I.N. SOCKET



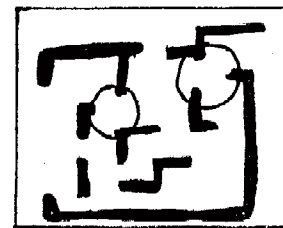
## PIN CONNECTIONS

- 1 - GROUND
- 3 - COMBINED SYNC
- 4 - BLUE
- 7 - RED
- 8 - GREEN

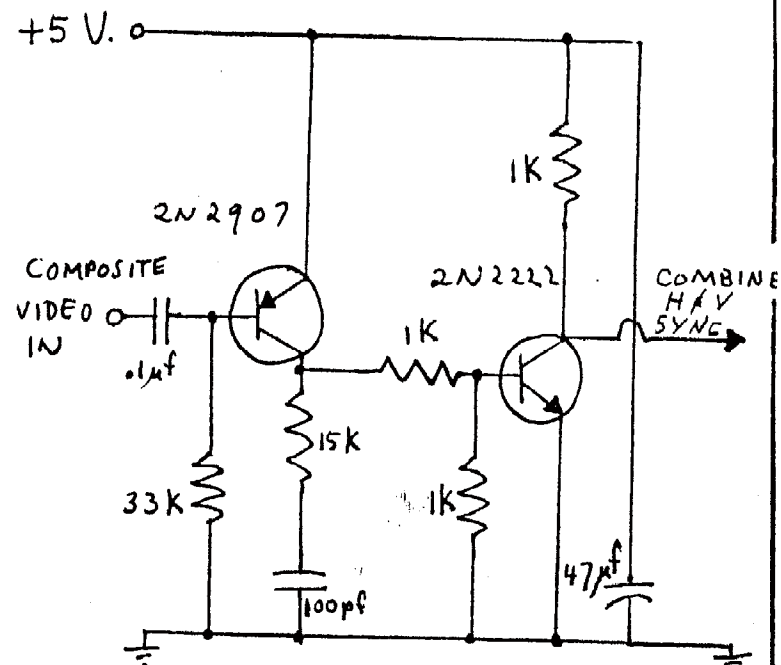
## SUGGESTED

## BOARD

## LAYOUT:



## SYNC SEPERATOR CIRCUIT



# C U R S O R J O Y S T I C K

(for ZX81 & 2068)

Many ZX81 and Spectrum programs allow for the use of a cursor joystick. Here are two ideas on providing a joystick port for a ZX81 or a 2068 using the Spectrum ROM.

The first method does not require building any circuitry but your joystick must be modified. With the addition of two diodes and a dpdt switch inside the joystick, it can be used as a regular joystick or a cursor joystick. This versatility would be handy for a 2068, but for a ZX81 the switch could be left out. Although my prototype version performed well with my 2068, it should be noted that the cable on the joystick may add enough capacitance to cause some keys not to respond while it is plugged in.

The second method is superior due to the use of 4066 bilateral switches. Here the joystick works on 5 volts and its cable length is not important. Any Atari-type unit will work. I built my switching circuit on a board 2.5" x .75" and mounted it inside the keyboard where all the input lines were readily available. Then I ran a cable from there to the male joystick port which was attached to the side of the computer.

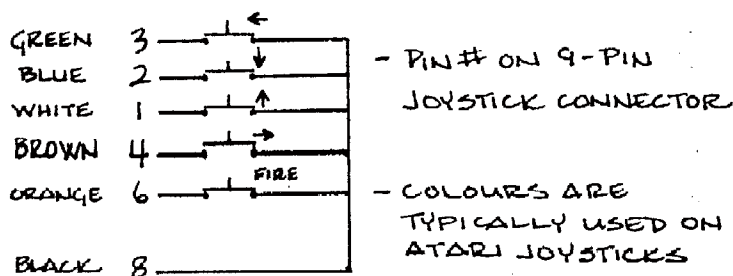
Now I am really looking forward to trying some of the thousands of software titles for the Spectrum!

FRED SCHAKEL  
London T/S Club

LOOKING INTO  
MALE PLUG

1 2 3 4 5  
6 7 8 9

## STANDARD ATARI-TYPE JOYSTICK



# K E Y B O A R D P R O B L E M S

Recently I replaced my 2068 keyboard with an expanded 66-key version. It was originally constructed as an add-on unit to plug into the rear of my 2068, onto a connector that was wired to the keyboard lines. The original keyboard was left intact. Every key worked fine except a few double-key commands such as SYM/SHIFT G, SYM/SHIFT D, SHIFT B, and SHIFT M. Also, some functions such as STOP, did work but the auto-repeat didn't when the key was held down.

In search of a solution, I shortened the 14-wire cable from 16" to 8". This corrected a few of the non-working functions. By changing the bundled cable to ribbon-cable, no difference was made.

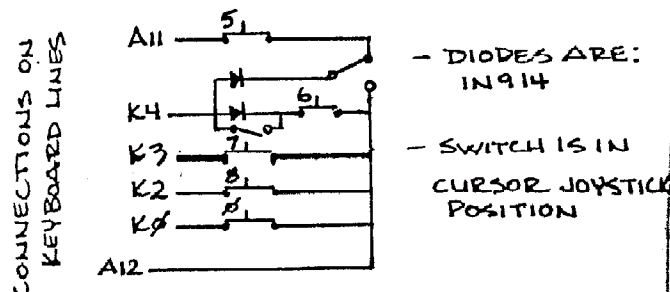
Finally, I mounted the new keyboard in place of the old one and used a short cable to connect directly to the jack on the 2068 pcb. Now everything is working properly. There were never any wiring faults but the addition of the extra wiring on the hand-wired keyboard just had too much capacitance.

Later, I added a cursor joystick which was also connected to the keyboard jack. This recreated the same problems. I used 4066 bilateral switches for a joystick interface to overcome the problem this time.

Several people converted their ZX81 keyboards and got similar problems. Every key function worked but LPRINT and the graphic on the S-key did not. In two cases this key seemed to be the one most affected. One of these was simply corrected by disconnecting the original keyboard which was still mounted inside the keyboard case.

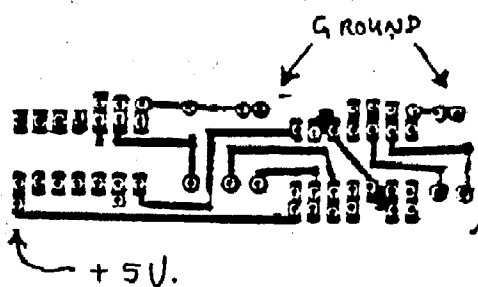
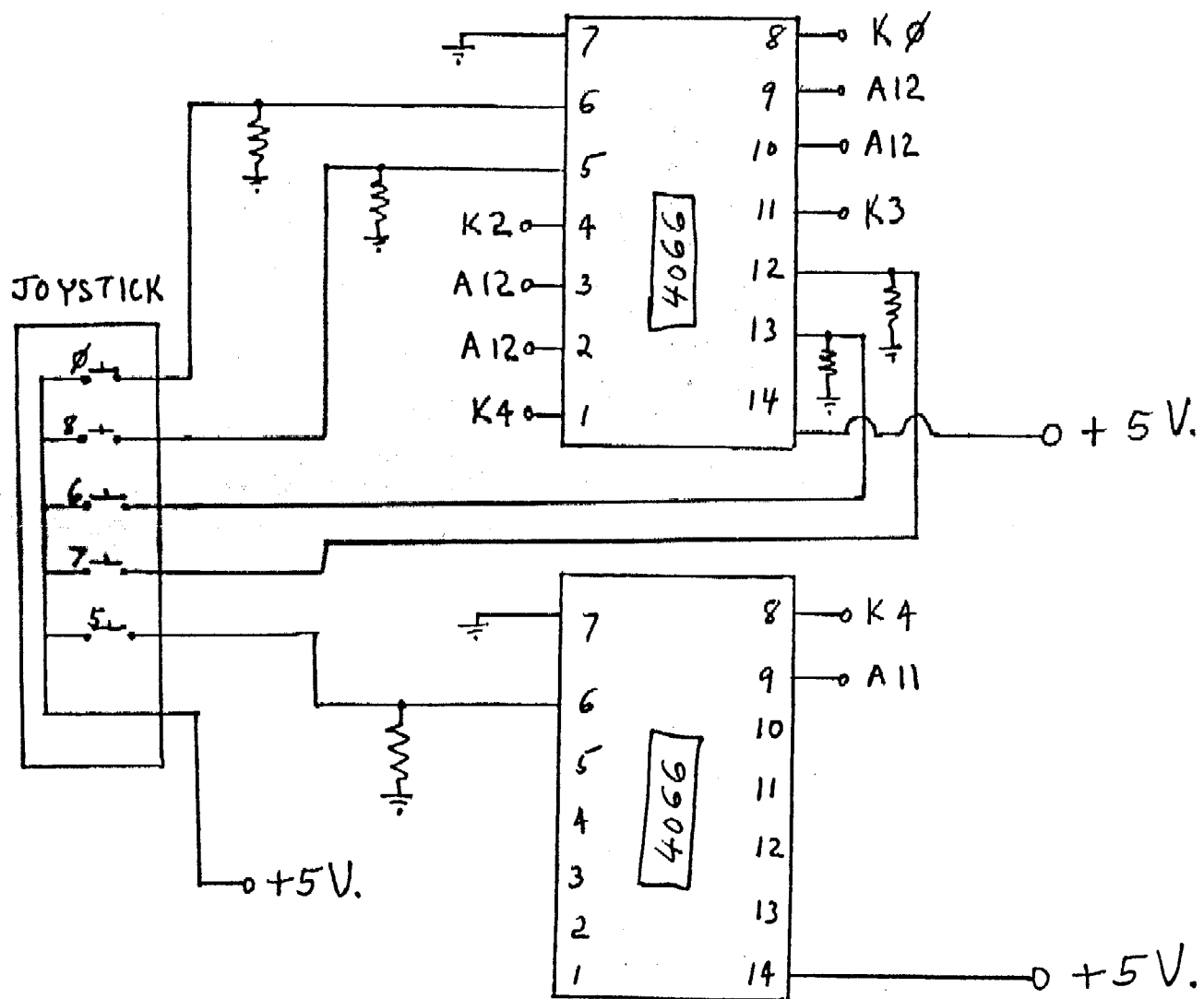
FRED SCHAKEL  
London T/S Club

## MODIFIED CURSOR JOYSTICK



# CURSOR JOYSTICK INTERFACE

(ALL RESISTORS = 1 MEG  $\Omega$ )



← ACTUAL BOARD LAYOUT

## ANNOUNCING: ~~THE~~ WORD SINCE 11.5 ~~THE~~

This is WSII.5, an all-new version of Powell Hargrave's WSII.4, extensively re-worked by Peter McMullin. Contains complete driver code for the Epron Services I/F, but can be EASILY set up to drive ANY popular Centronics I/F for ZX81.

### NEW FUNCTIONS INCLUDE:

- IMPROVED AUTO-REPEAT
- Form Feed with automatic page OR from text
- Embedded printer escape codes are transparent to text justify routines
- Automatically adjusts to available RAM size
- All printer-dependent codes are easily modified
- LEFT MARGIN permits multiple justified text columns, multiple TABs, indents, outdents
- SEARCH, REPLACE, DELETE, MOVE functions provided
- WSII.5G has a very efficient bit-image printer graphics utility built in.
- PRINTSCREEN copies ZX screen characters to any graphics-capable printer!
- Supports WordFont, a custom-typeface utility
- Plus many other features.

Sample WordFont typefaces are shown next column. Note that all fonts may be printed double-width, and/or in inverse!

PRINTSCREEN as a separate utility also available for any Centronics I/F.

**THIS IS SANS SERIF BLOCK,  
BOLD WITH AN UPPER-LOWER CASE.**

**This is SERIF HEAVY, more  
stylized, with a personality!**

**This is SCRIPT, a traditional  
custom font- design application.**

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to the computer-card age.**

WSII.5.....\$30.00 +\$1.00 P&H  
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